

Applic. No.: 10/695,367  
Amdt. Dated November 9, 2006  
Reply to Office action of August 9, 2006

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**REMARKS/ARGUMENTS**

Reconsideration of the application is requested.

Claims 1-13 remain in the application. Claim 1 has been amended.

In the third paragraph on page 2 of the above-identified Office action, claim 1 has been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

More specifically, the Examiner has stated that the mere absence of a positive recitation is not basis for an exclusion and the disclosure of the instant application does not disclose that the shape stabilizers are detrimental to the invention and/or excluded from the composition.

The limitation "the material mixture having no additional shape-stabilizing agent" added in the previous response has now been deleted.

In the paragraph bridging pages 2 and 3 of the above-identified Office action, claim 1 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

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More specifically, the Examiner has stated that neither the disclosure nor the claims recite what materials are encompassed by the limitation "the material mixture having no additional shape-stabilizing agent."

Applicants believe that a person skilled in the art would know what materials are encompassed by shape-stabilizing agent. Nevertheless, the limitation "the material mixture having no additional shape-stabilizing agent" has been deleted as discussed above.

It is accordingly believed that the specification and the claims meet the requirements of 35 U.S.C. § 112, first and second paragraphs. Should the Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved. The above-noted changes to the claims are provided solely for cosmetic and/or clarificatory reasons. The changes are neither provided for overcoming the prior art nor do they narrow the scope of the claims for any reason related to the statutory requirements for a patent.

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In item 1 on pages 3-4 of the above-mentioned Office action, claims 1-4 and 6-13 have been rejected as being anticipated by Bonin (US 5,094,780) under 35 U.S.C. § 102(b).

In item 2 on page 4 of the above-mentioned Office action, claims 1, 3, and 7-13 have been rejected as being anticipated by Neuschuetz et al. (WO 2003/046982 - US 2005/0007740 A1 is used as the English translation of WO 2003/046982 and will be referred to in the following discussion) under 35 U.S.C. § 102(a).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

A material mixture, comprising: an amount of a phase change material and an amount of particulate expanded graphite mixed with said phase change material.

The mixtures disclosed by Bonin contains **expandable** graphite, not **expanded** graphite (see, for example, column 1, lines 28-29

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and lines 40-41, and column 2, lines 26-27 and lines 30-31, and lines 40-41 of Bonin). There is a significant difference between expandable graphite and expanded graphite because expandable graphite is still capable to expand (Bonin, column 1, lines 36-38), while the expanded graphite used in the present invention has already been subjected to an expansion process (see page 7, line 14 to page 9, line 4 of the specification of the instant application). Bonin's disclosure mainly relates to fire protection (column 1, line 6). It is known to use expandable graphite for such purposes (Bonin, column 1, line 8). The fire-protecting effect of expandable graphite is based on its capability to expand (intumesce) due to the increase of temperature in case of a fire, and thus form a protection, which does not burn easily, and/or seal cavities through which fire gases would pass (column 1, lines 8-15).

According to Bonin, the mixture is further processed by filling the mixture into a mold, heating the filled mold to temperatures between 150 and 350°C (preferably 200 to 300°C). The moldings obtained can have densities of, for example, 200 to 900 kg/m<sup>3</sup>, preferably 350 to 700 kg/m<sup>3</sup> (Bonin, column 2, lines 58-64).

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It has to be noted that the density given here by Bonin relates to the mold obtained from the mixture comprising expandable graphite and other components (binders, filters, etc.), and therefore cannot be compared to the density of the expanded graphite used in the mixture of the present invention.

In the case of molding pure expandable graphite instead of a mixture, the density of the mold is given as  $0.5 \text{ g/cm}^3$  (Bonin, column 3, lines 45-48). **In contrast to the Examiner's allegation** (see the penultimate sentence on page 3 of the Office action), **this is equal to 500 g/l (not 50 g/l)**. Thus, in Bonin the density is more than twice the upper limit of claim 5 of the instant application, clearly showing that the graphite materials used by bonin and in the present invention are significantly different.

The higher density of the molded expandable graphite in Bonin is related to the fact that in order to act as intumescent agent, the graphite needs to have the capability of remarkable further expansion after being molded into the desired shape (see Bonin, column 1, lines 22-27 and column 4, lines 4-9). Therefore, the composition of the shaped (molded) bodies obtained by Bonin and by the method of the present invention (claims 8-13) is different because Bonin's shaped bodies

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contain graphite which is still expandable, while in the present invention the graphite is already expanded.

Clearly, Bonin does not show an "expanded graphite" as recited in claim 1 of the instant application.

Expanded graphite is mentioned only in paragraph [0034] of Neuschuetz et al., corresponding to page 10, lines 15-23 of WO 2003/046982. This paragraph reads:

*Suitable for use of the PCMs are encapsulated materials, solid-solid PCMs, **PCMs in matrices**, solid-liquid PCMs in cavities or a mixture of the said forms. **Suitable matrices for solid-solid or solid-liquid PCMs** are in particular polymers, graphite, **for example expanded graphite** (for example Sigri .lambda. from SGL), or porous inorganic substances, such as, for example, silica gel and zeolites. At least one PCM used in accordance with the invention is preferably a solid/solid PCM.*

This does not disclose a mixture of phase change material(s) and particles of expanded graphite, but a mixture of phase change materials which might be incorporated in a matrix made of expanded graphite. Such composites comprising a matrix made of expanded graphite and a phase change material were also mentioned in the prior art section of the instant application (see page 3, line 4 to page 4, line 2 of the specification).

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In composition materials science and technology, the matrix phase is the **continuous** phase (see the definition in the attached excerpt from the textbook "The Science and Engineering of Materials"). Thus, when the phase change material is "in a matrix" of expanded graphite, as in Neuschuetz et al., this means to a person skilled in the art of composite materials that the matrix forms a **continuous, contiguous framework-like structure** with the phase change material embedded therein.

In contrast, in the present invention there is no continuous framework, but separate, discrete particles of expanded graphite which are mixed with the phase change material(s) (see e.g. page 7, lines 1-3: "a mixture of expanded graphite in particle form and a phase change material").

Thus, a mixture of **expanded graphite in particle form** and a phase change material is not anticipated by Neuschuetz et al. because Neuschuetz et al. only teach phase change materials in a matrix of expanded graphite. In other words, Neuschuetz et al. disclose a composite material containing a continuous structure of expanded graphite and a phase change material incorporated therein, while the present invention discloses a mixture of discrete particles of expanded graphite and a phase change material.

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As discussed in the prior art section of the specification of the instant application, the manufacture of matrix-based phase change materials has significant drawbacks, which are overcome by the present invention (see page 4, lines 4-20).

It is noted that the same argumentation has already been used in the previous response to overcome the rejection over US 2002/0060063 (Neuschutz et al.) and the Examiner has indicated in the first paragraph of this final Office action that the argumentation is considered persuasive.

Clearly, Neuschuetz et al. do not show a mixture of a particulate expanded graphite and a phase change material as recited in claim 1 of the instant application.

In item 1 on pages 5-6 of the above-mentioned Office action, claim 5 has been rejected as being unpatentable over Bonin under 35 U.S.C. § 103(a).

The Examiner has stated that the claimed particle size would be obvious over the technical data for the expanded graphite available from Timcal.

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The citation of the Timcal datasheet is not appropriate because the Timcal datasheet is related to expanded graphite while Bonin's teaching is related to expandable graphite (see the discussion above in connection with Bonin).

In item 2 on pages 6-7 of the above-mentioned Office action, claims 1-13 have been rejected as being unpatentable over Gally et al. (US 2002/0016505) in view of Neuschuetz et al. under 35 U.S.C. § 103(a).

Neuschuetz et al. teach a matrix-based phase change material, wherein the matrix might be made of expended graphite (see discussion above).

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Gally et al. teach a mixture (composition) comprising at least one phase change material and an auxiliary agent that facilitates thermal conductivity. According to paragraph [0032], this auxiliary might be graphite, especially a commercially available **synthetic graphite** (KS6 from Timcal).

A combination of Neuschuetz et al. and Gally et al. do not lead to the mixture of the present invention because there is no indication that the synthetic graphite disclosed by Gally et al. could be replaced by expanded graphite in particulate form.

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In fact, the disclosure of synthetic graphite by Gally et al. teaches away from the present invention because there are significant differences between synthetic graphite and expanded graphite (see page 10, line 10 to page 12, line 8 and example 1 of Gally et al. vs. the comparable example of the invention of the instant application).

It seems that here an analogous argumentation is valid as used in the previous response to overcome the § 103 rejection over Neuschutz et al. US 2002/0060063 in combination with Neuschutz et al. US 2002/0033247. As indicated in the first paragraph of this final Office action, the argumentation is considered persuasive by the Examiner.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Claim 1 is, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-13 are solicited.

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In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

**In the alternative, the entry of the amendment is requested as it is believed to place the application in better condition for appeal, without requiring extension of the field of search.**

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to the Deposit Account of Lerner Greenberg Stemmer LLP, No. 12-1099.

Respectfully submitted,

  
Yonghong Chen (56,150)

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Lerner Greenberg Stemmer LLP  
Post Office Box 2480  
Hollywood, FL 33022-2480  
Tel: (954) 925-1100  
Fax: (954) 925-1101

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## Glossary

**Brazing** A process in which a liquid filler metal is introduced by capillary action between solid-based materials that are to be joined. Solidification of the brazing alloy provides the bond of high strength. Also known as pyrolyzing.

**Carbonizing** Driving off the non-carbon atoms from a polymer fiber, leaving behind a carbon fiber of high strength.

**Cemented carbides** Particulate composites containing hard ceramic particles bonded with a metallic matrix. The composite combines high hardness and cutting ability, yet still has good shock resistance.

**Chemical vapor deposition (CVD)** Method for manufacturing materials by condensing the material from a vapor onto a solid substrate.

**Cladding** A laminar composite produced when a corrosion-resistant or high-hardness layer of a laminar composite is formed onto a less expensive or higher-strength backing.

**Delamination** Separation of individual plies of a fiber-reinforced composite.

**Dispersed phase** The phase or phases that are dispersed in a continuous matrix of the composite.

**Dispersoids** Tiny oxide particles formed in a metal matrix that interfere with dislocation movement and provide strengthening, even at elevated temperatures.

**Filament winding** Process for producing fiber-reinforced composites in which continuous fibers are wrapped around a form or mandrel. The fibers may be prepregged or the filament-wound structure may be impregnated to complete the production of the composite.

**Honeycomb** A lightweight but stiff assembly of aluminum strip joined and expanded to form the core of a sandwich structure.

**Hybrid organic-inorganic composites** Nanocomposites consisting of structures that are partly organic and partly inorganic, often made using sol-gel processing.

**Matrix phase** The continuous phase in a composite. The composites are named after the continuous phase (e.g., polymer-matrix composites).

**Nanocomposite** A material in which the dispersed phase is nano-sized and is distributed in the continuous matrix.

**Precursor** A starting chemical (e.g., a polymer fiber) that is carbonized to produce carbon fibers.

**Prepregs** Layers of fibers in unpolymerized resins. After the prepregs are stacked to form a desired structure, polymerization joins the layers together.

**Pultrusion** A method for producing composites containing mats or continuous fibers.

**Rovings** Bundles of less than 10,000 filaments.

**Rule of mixtures** The statement that the properties of a composite material are a function of the volume fraction of each material in the composite.

**Sandwich** A composite material constructed of a lightweight, low-density material surrounded by dense, solid layers. The sandwich combines overall light weight with excellent stiffness.

**Sizing** Coating glass fibers with an organic material to improve bonding and moisture resistance in fiberglass.

**Specific modulus** The modulus of elasticity divided by the density.

**Specific strength** The tensile or yield strength of a material divided by the density.

**Staples** Fibers chopped into short lengths.

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